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Development of Sulfite Biosensor Based on Sulfite Oxidase Immobilized on 3-Aminoproplytriethoxysilane Modified Indium Tin Oxide Electrode

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Abstract : Sulfite has been used as a versatile preservative to limit the microbial growth and to control the taste in some food and beverage. However, it has been reported to cause a wide spectrum of severe adverse reactions. Therefore, it is important to determine the amount of sulfite in food and beverage to ensure consumer safety. An efficient electrocatalytic biosensor for sulfite detection was developed by immobilizing of human sulfite oxidase (hSO) on 3-aminoproplytriethoxysilane (APTES) modified indium tin oxide (ITO) electrode. Cyclic voltammetry was employed to investigate the electrochemical characteristics of the hSO modified ITO electrode for various pretreatment and binding conditions. Amperometry was also utilized to demonstrate the current responses of the sulfite sensor toward sodium sulfite in an aqueous solution at a potential of 0 V (vs. Ag/AgCl 1 M KCl). The proposed sulfite sensor has a linear range between 0.5 to 2 mM with a correlation coefficient 0.972. Then, the additional polymer layer of PVA was introduced to extend the linear range of sulfite sensor and protect the enzyme. The linear range of sulfite sensor with 5% coverage increases from 2.8 to 20 mM at a correlation coefficient of 0.983. In addition, the stability of sulfite sensor with 5% PVA coverage increases until 14 days when kept in 0.5 mM Tris-buffer, pH 7.0 at 4 8C. Therefore, this sensor could be applied for the detection of sulfite in the real sample, especially in food and beverage.

Keywords : sulfite oxidase, bioelectrocatalytsis, indium tin oxide, direct electrochemistry, sulfite sensor
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